

SWET2018
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Infrastructure Investment News and Business Cycles:
Evidence from the VAR with External Instruments

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Version 2, 11:30PM,
August 5

Acknowledgement

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Objective

Propose a new approach to tackle the

“Fiscal Foresight” Problem

Main idea

Estimate the effects of a
“News Shock”
to public investment

= Changes in the public’s perception about the future course of the policy.

How can it be done??

- Utilize the **daily** indicator of public investment news shocks by Shioji & Morita (2017), which combines:
 - **Newspaper** analysis.
 - **Stock market** response to the news.
- Incorporate this into the **VAR with External Instruments (VAR-IV)** as the instrument.

Structure of presentation

1. Introduction
2. News Indicator: details
3. VAR with External Instruments (VAR-IV)
4. Results
5. Conclusions

1. Introduction

Why Public Investment?

- Always a subject of heated debate in Japan.
- And... suddenly, also in the US! (since late 2016...)

Difficulty in estimating the impact
= “**Fiscal Foresight**” Problem

Most fiscal policy measures
are **pre-announced**.

Our previous paper:
How can we make
unobserved expectations observable?

Literature (1) News-based approach

- **Ramey & Shapiro (Carnegie 1997), Ramey (QJE 2011)**: news about future US military spending.
- For Japan: **Fukuda & Yamada (JJIE 2011)**:
News on [Emergency Fiscal Stimulus Packages](#).
- Drawback = No sense of **magnitude** or **surprise**

Literature (2) Stock based approach

- **Fisher & Peters (EJ 2010)**
 - Excess return on four large military contractors in the US.
- Drawbacks = They are **Contaminated** signals.
- **Morita (Ph.D. thesis, 2014)**
 - Excess returns of the Construction Industry for Japan.
 - “**Purified**” measure based on SVAR.

Our previous paper combined the two!

- **Excess returns** of individual construction companies **on the news dates.**
- Advantages:
 - Produces a **single time series.**
 - It reflects the **magnitudes of the surprises.**
 - Daily data -> **less contaminated.**

This paper:

How should we utilize this indicator?

VAR with External Instruments!!

2. News Indicators

[1] News Analysis side: List of FP events

1. Extension of the Fukuda-Yamada list of Emergency Stimulus Measures beyond 2010.
2. Reconstruction Budget after the Great East Japan Earthquake.
3. Important National Elections.
4. Natural Disasters (three earthquakes and a tunnel collapse).
5. Future Sports Events (Nagano, World-cup, Tokyo)
6. “Negative” Fiscal Events (Hashimoto reform, Koizumi reform, “Shiwake”).

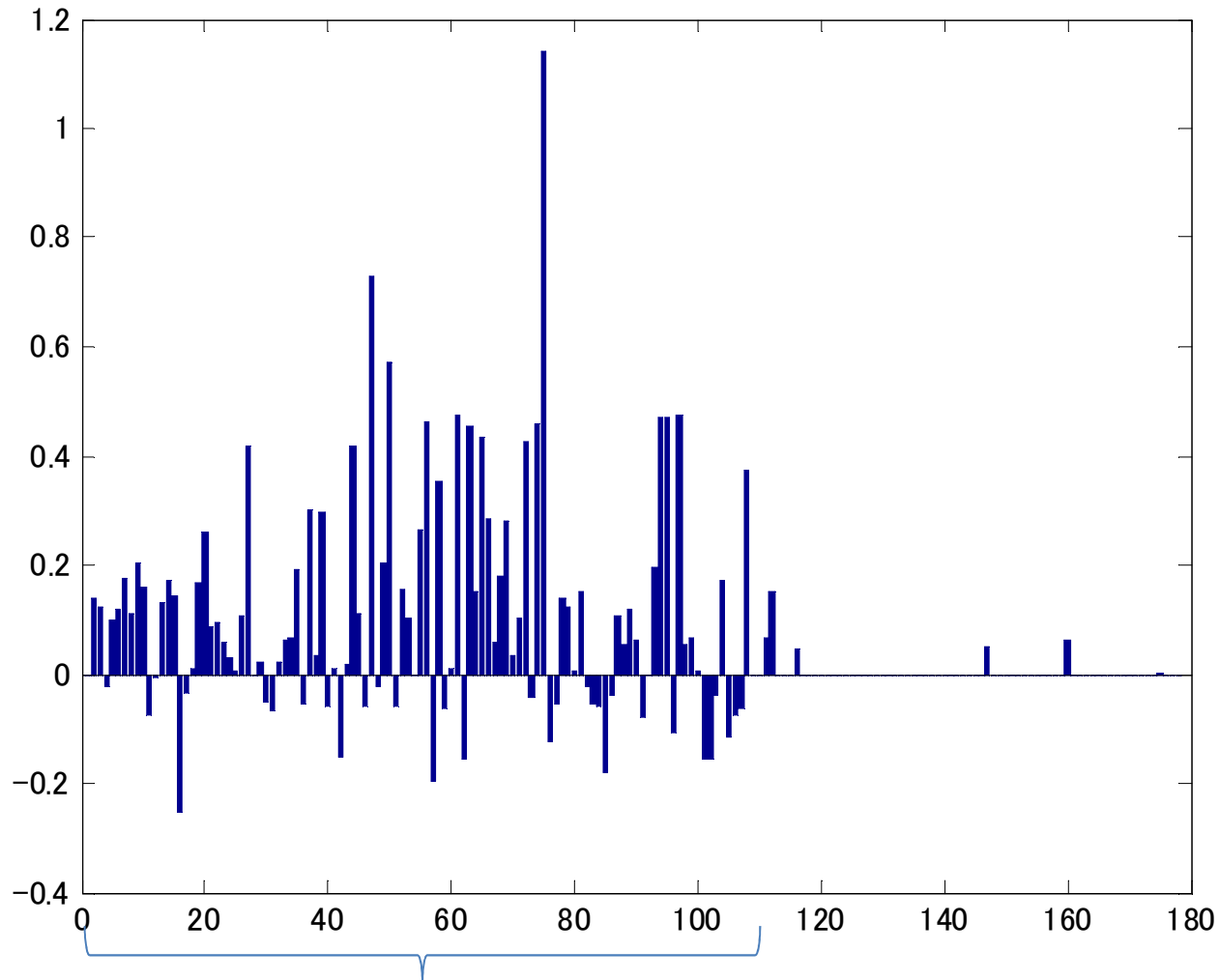
Identified **38 FP events**; **159 dates**.

[2] Stock market side

- Original data: Construction industry's 177 firms, listed on Tokyo Stock Exchange (1st or 2nd), at some point between 1974 and 2014.
- Returns = log difference of the close price.
- We regress them on the Market (TOPIX) return to obtain excess returns.
- **Are they really informative?** Let's see...

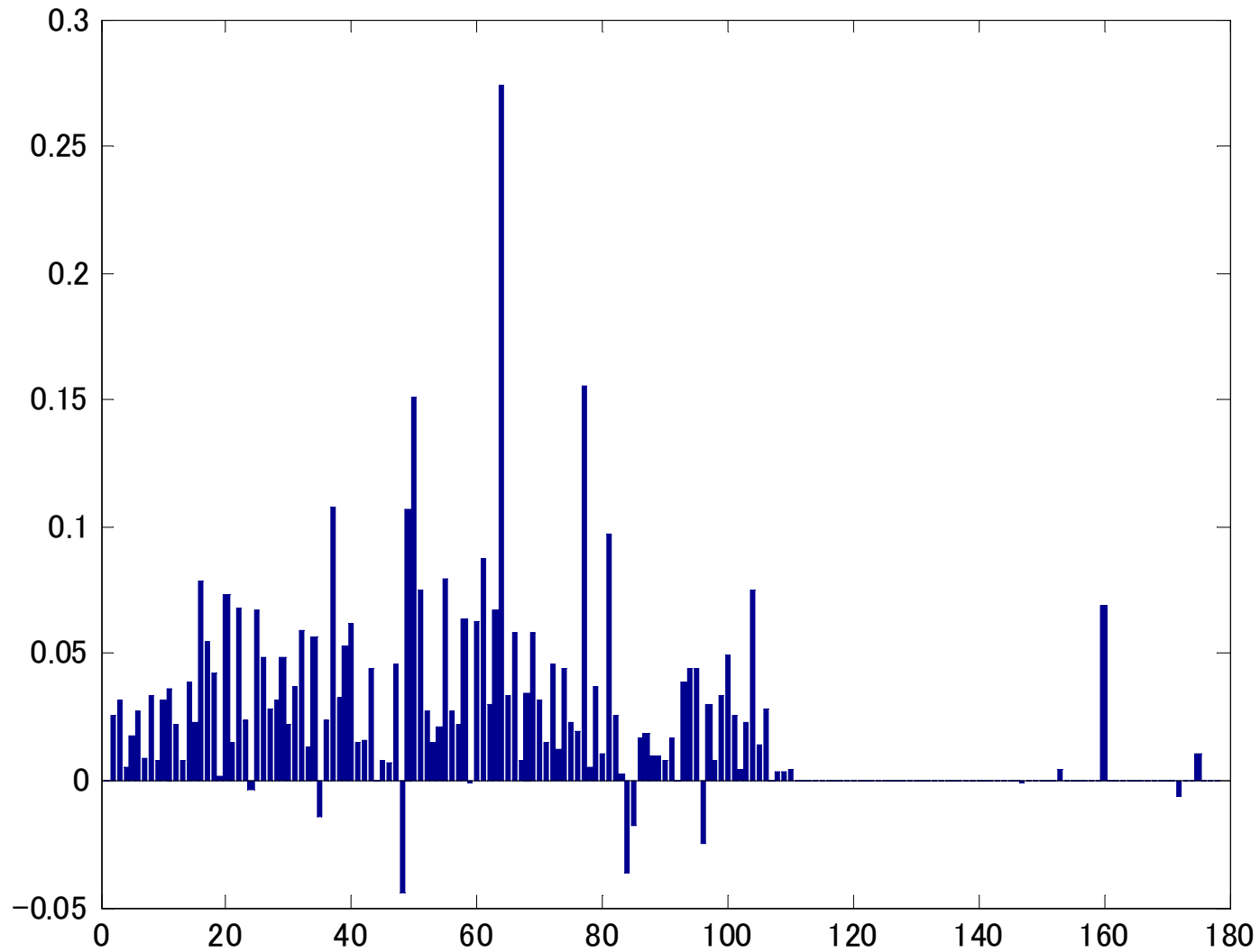
Excess returns by firm

(a) Great East Japan Earthquake (March 14-15, 2011)

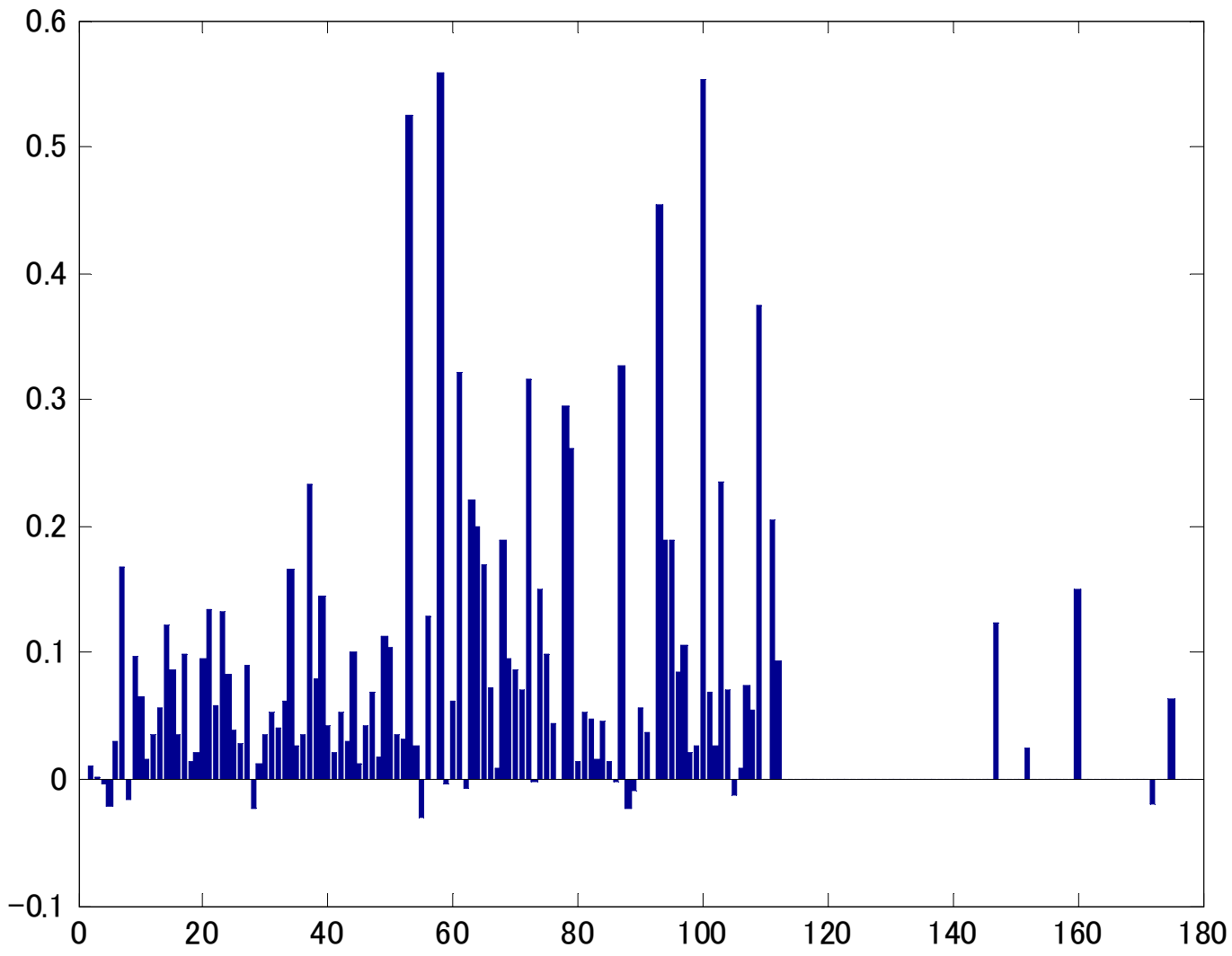


Ranking based on the total market value as of 2012 (if present).

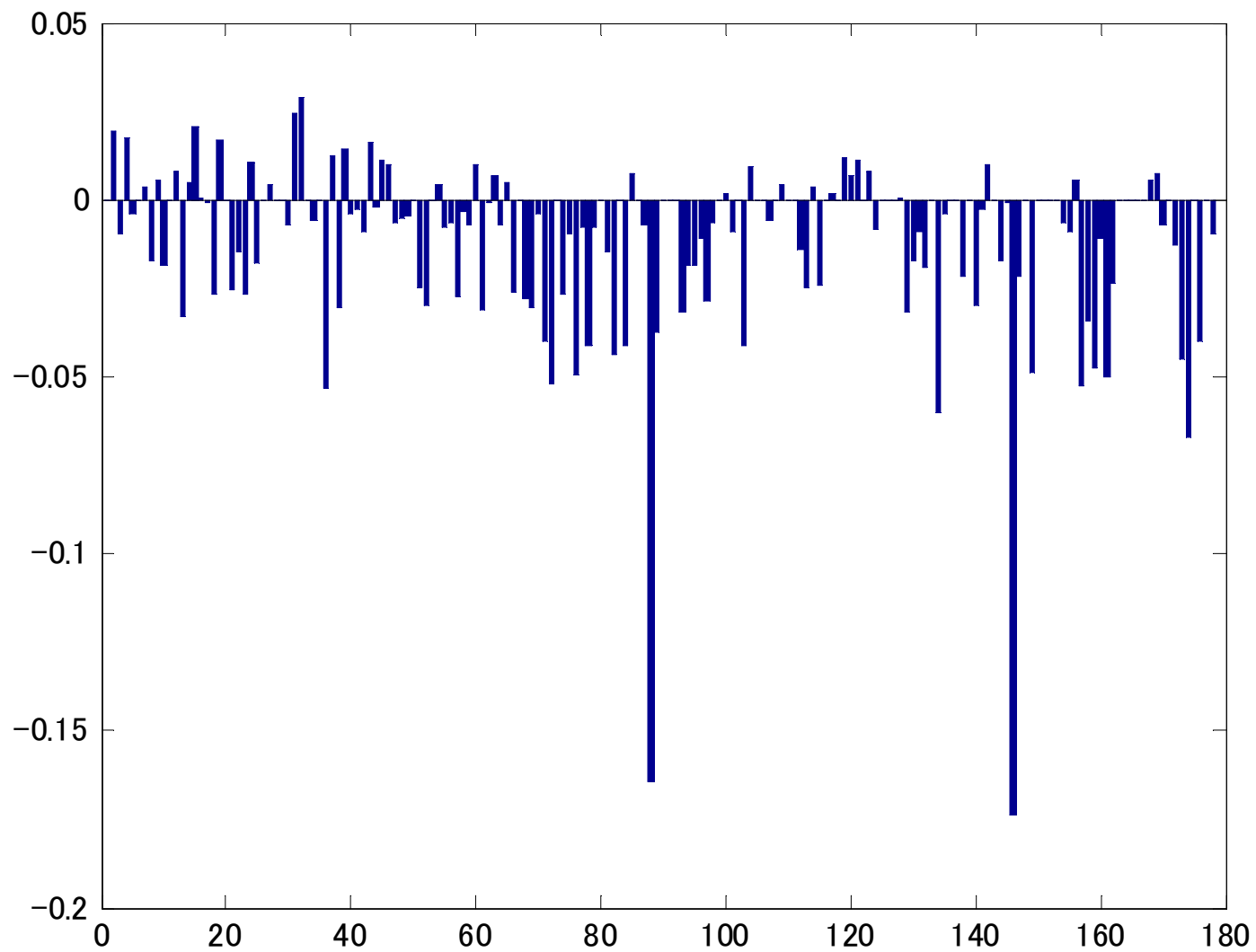
(b) Sasako Tunnel Failure (December 3-5, 2012)



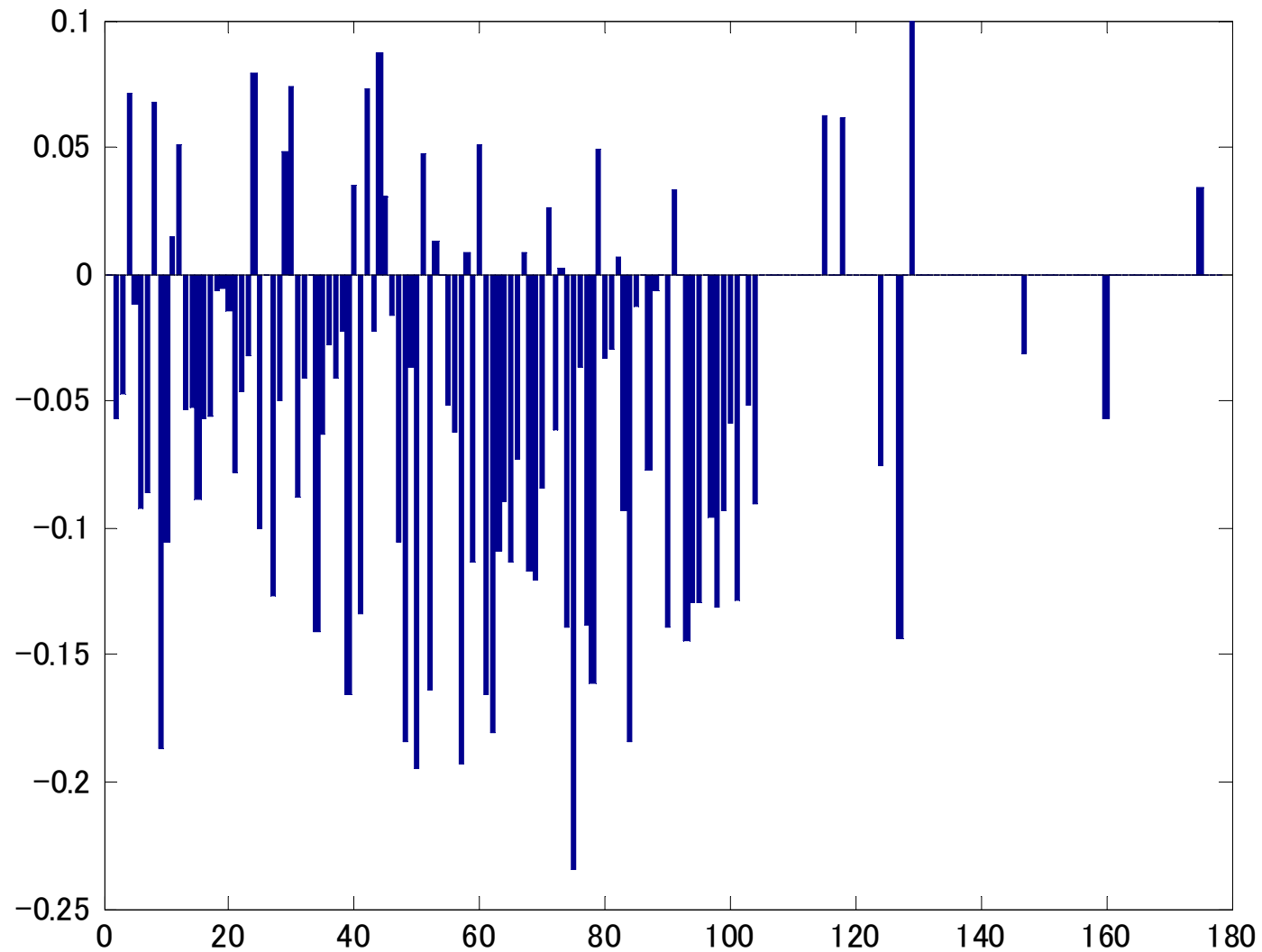
(c) IOC gives the Olympics 2020 to Tokyo (Sept 9-11, 2013)



(d) FIFA gives World Cup 2002 to Korea/Japan (June 3, 1996)



(e) "Shiwake" (Nov 10-27, 2009)

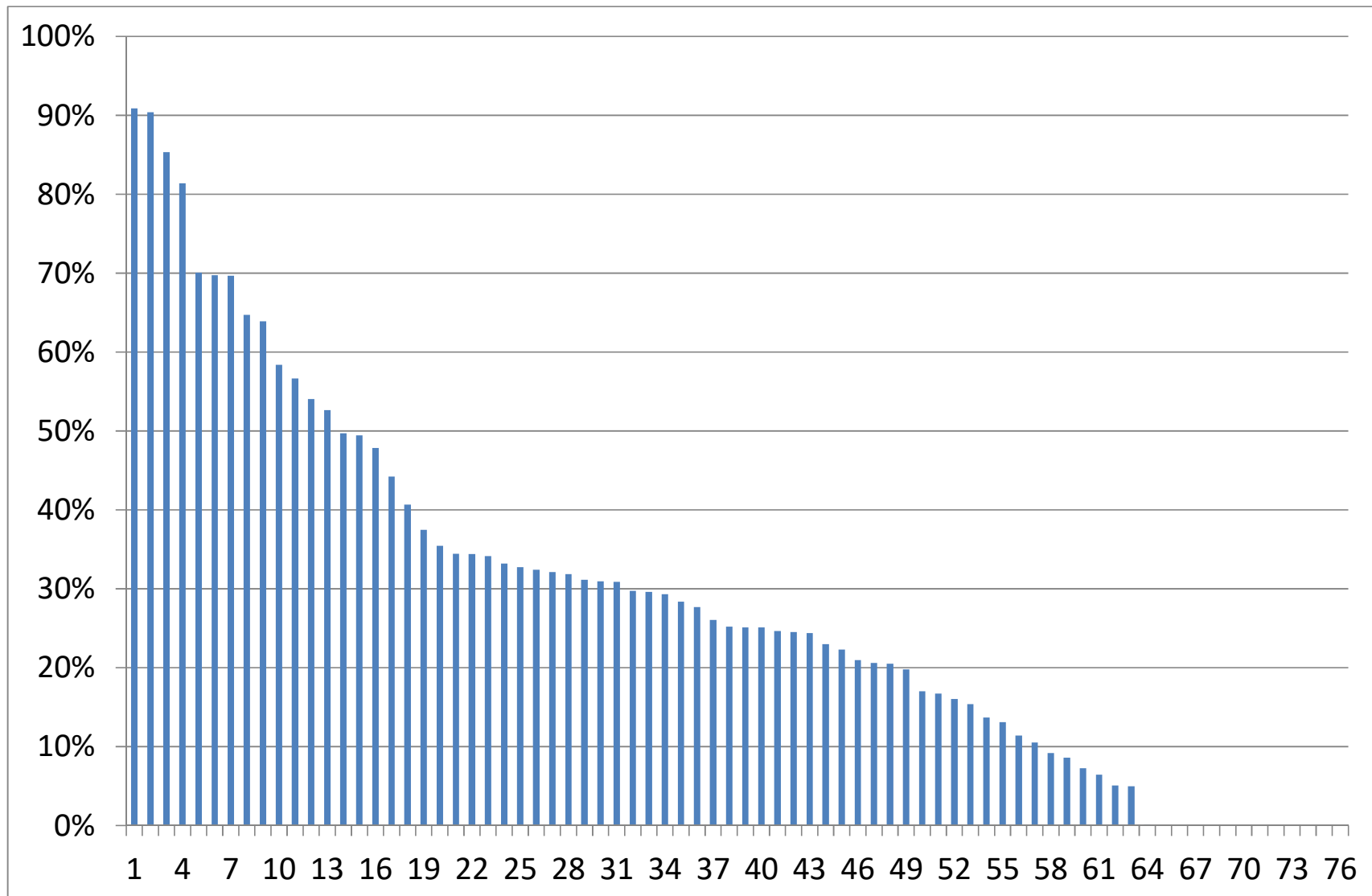


How do we combine the two sides?

- Take a simple average?
- But it may reflect all sorts of things.
- Instead, we take advantage of **within-industry heterogeneity.**
- From here, data is limited to 76 firms that existed throughout the period 1990-2014.

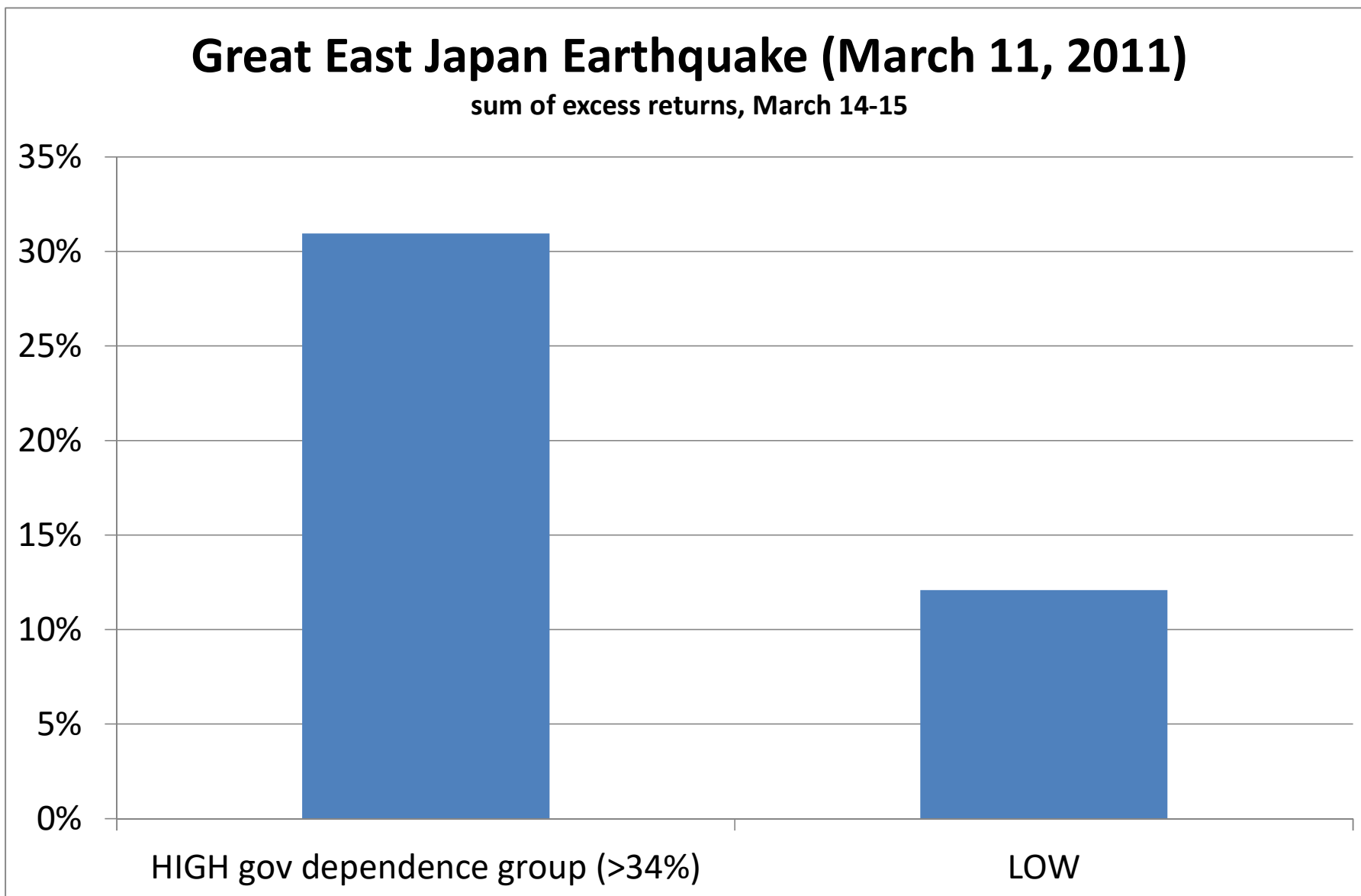
Dependence on Public Investment

= Share of Public work in Total (as of 2000)



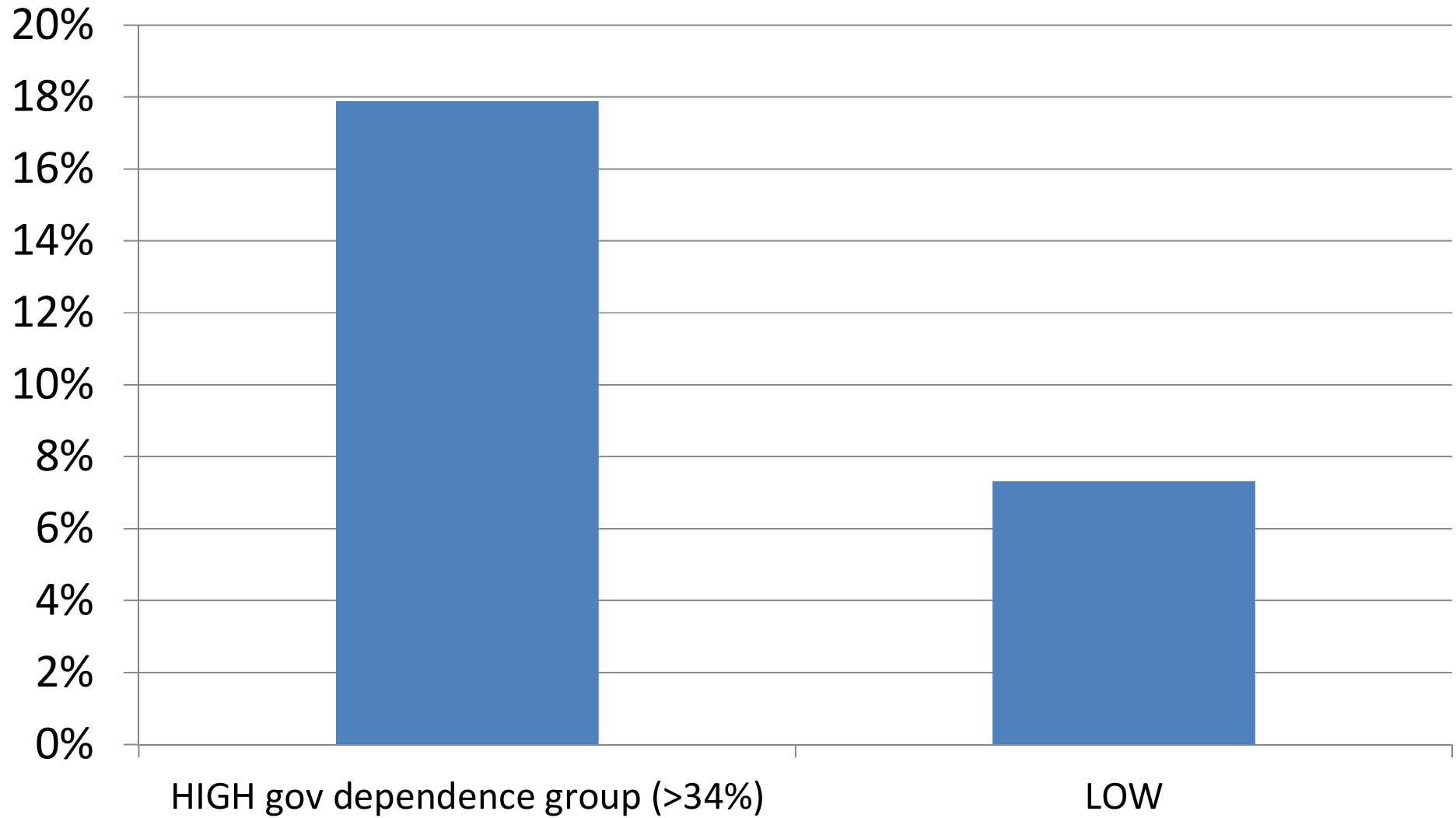
Cross-group heterogeneity?

Example from a big “news” event...



IOC announces Tokyo to hold the Olympics Games

sum of excess returns, Sept. 8-10, 2013



Two stock market indices

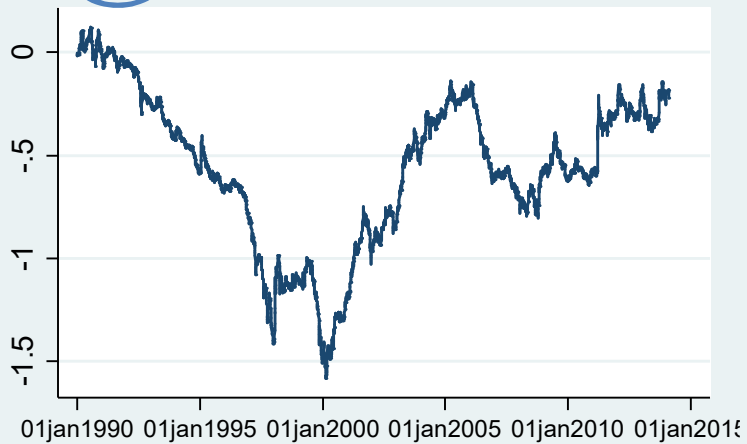
- **Stock Mkt Index 1** = “High – Low”
= (Avg of Upper Half) – (Avg of Bottom Half)
- **Stock Mkt Index 2** = “G-factor”
 - Extract 5 common factors -> **Rotate** them!
 - **Target rotation**: Select a rotation which gives the closest factor loadings to... (see next page)

Target for rotation

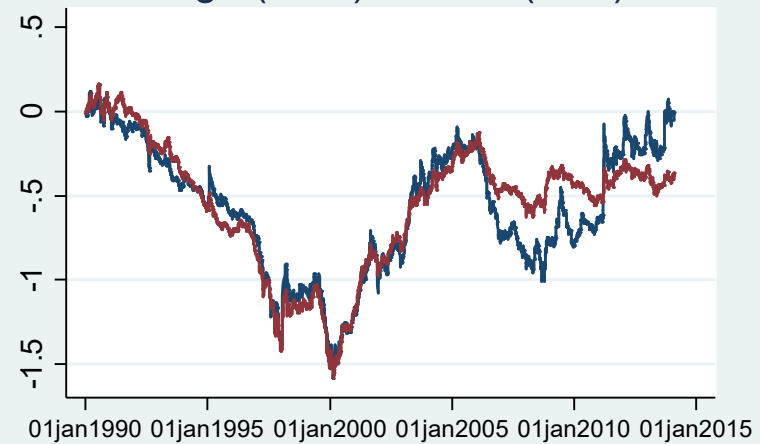
	(1) Industry -wide Factor	(2) Home Builders Factor	(3) G-Factor (Gov. Dependence)	(4) Electric Facilities Builders Factor	(5) Plant Builders Factor
Mid-sized Contractors	1	0	0/1	0	0
Big Four Contractors	1	1	0	0	0
Home Builders (all big)	1	1	0	0	0
Electric Facilities Builders	1	0	0/1	1	0
Plant Builders	1	0	0/1	0	1

Stock Mkt Index 1 & 2 (and 0), Cumulative

0 Mean Excess Returns



High (Blue) vs Low (Red)



1 High - Low



2 G-Factor

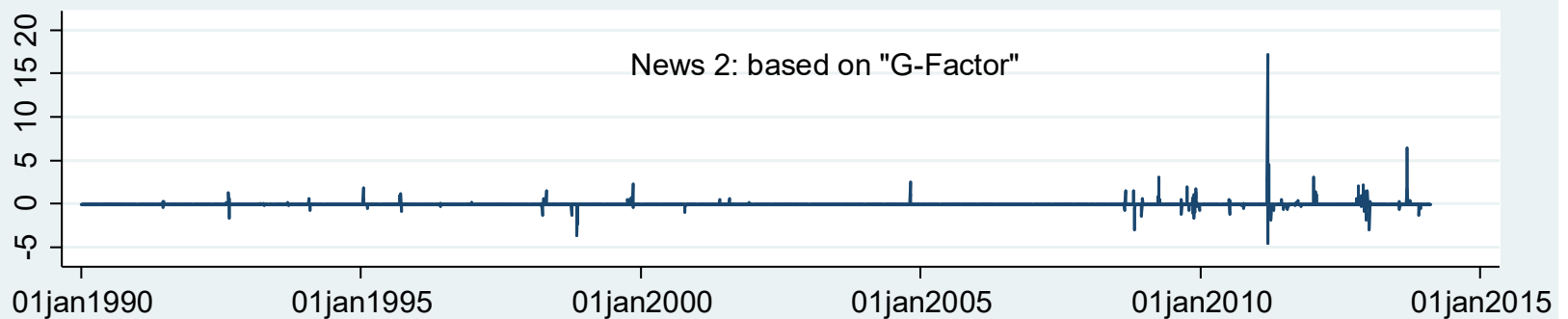
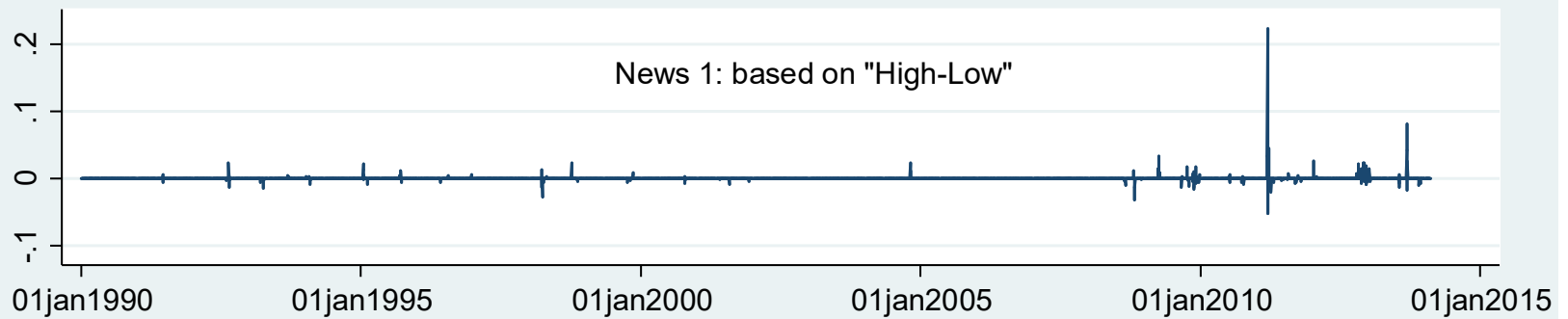
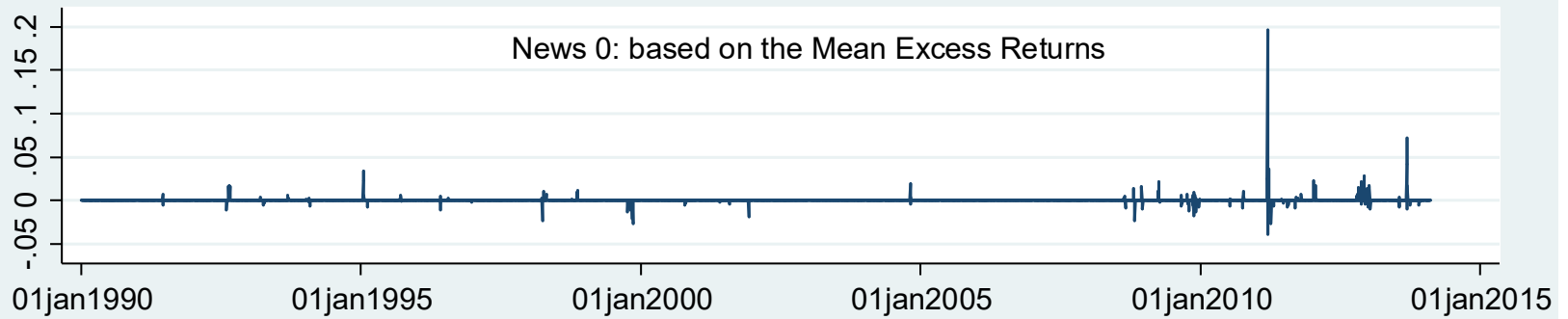


News indicator (1 & 2_{and 0})

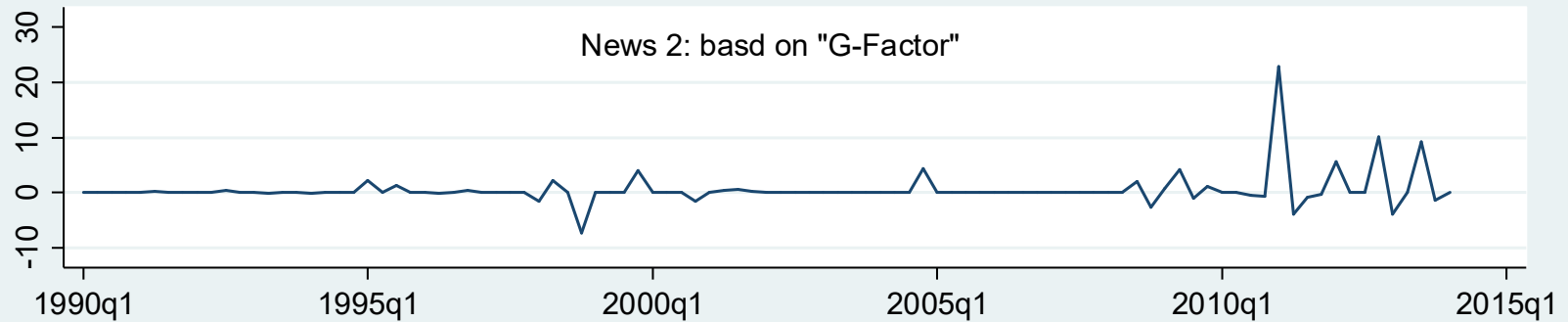
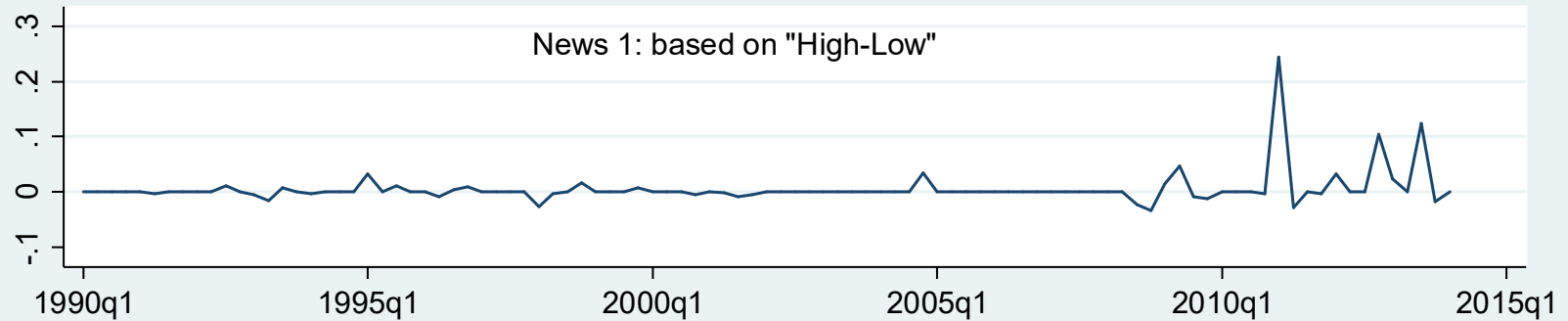
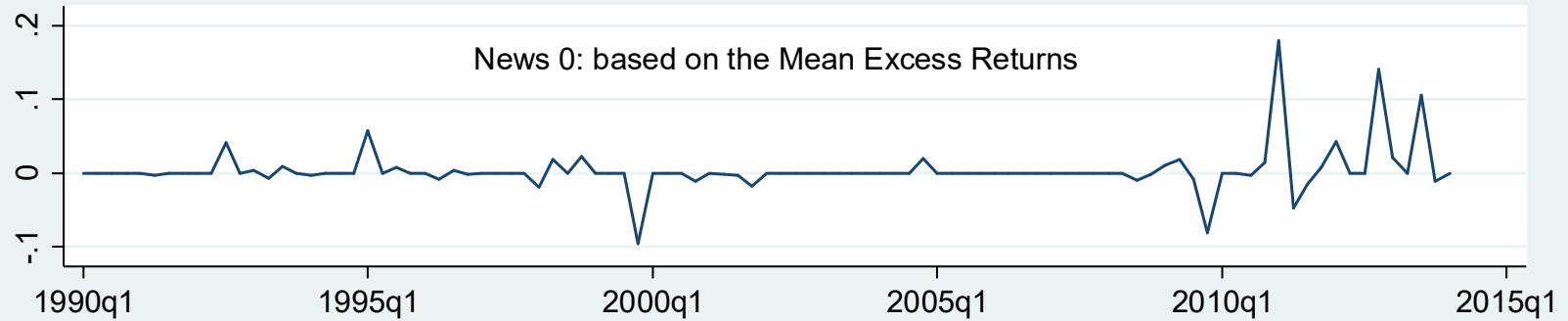
Defined as

(News dates)*(Stock mkt index 1 or 2_{or 0})

News indicators (daily)



News indicators (quarterly aggregates)



3. VAR-IV analysis

VAR-IV

- Stock and Watson (2012), Mertens and Ravn (2013), Gertler and Karadi (2015)
- Survey paper by Stock and Watson (NBER-WP24216, January 2018)
- Identification without exclusion restrictions.

Identifying assumptions

- IV is correlated with the true shock contemporaneously.
- IV is orthogonal to the other types of shocks

VAR-IV: **2** variables, **1** lag example

Reduced
form VAR

$$Y_t = AY_{t-1} + v_t$$

Structural
relationship

$$v_t = B\varepsilon_t$$

$$Y_t \equiv \begin{bmatrix} y_{1,t} \\ y_{2,t} \end{bmatrix}$$

Endogenous
variables

$$B \equiv \begin{bmatrix} b_{11} & b_{12} \\ b_{21} & b_{22} \end{bmatrix}$$

$$\varepsilon_t \equiv \begin{bmatrix} \varepsilon_{1,t} \\ \varepsilon_{2,t} \end{bmatrix}$$

Structural shocks
(mutually orthogonal)

VAR-IV, continued

Assuming
invertibility,

$$Y_t = C(L) B \varepsilon_t \quad \text{where } C(L) = (I - AL)^{-1}$$

$$\begin{bmatrix} b_{11} & b_{12} \\ b_{21} & b_{22} \end{bmatrix} \begin{bmatrix} \varepsilon_{1,t} \\ \varepsilon_{2,t} \end{bmatrix}$$

...then we just need to
know the first column of B !

Suppose we are
just interested in
the first shock...

VAR-IV, continued

Suppose we have an instrument Z_t which satisfies

Assumption 1: “relevance”

$$E \varepsilon_{1,t} Z_t = \alpha \neq 0$$

Assumption 2: “exogeneity”
(wrt the other shocks)

$$E \varepsilon_{2,t} Z_t = 0$$

then, $E v_t Z_t = \begin{bmatrix} b_{11} \alpha \\ b_{21} \alpha \end{bmatrix}$

Normalize to equal 1.
We can focus on b_{21} .

VAR-IV, estimation

Step 1: IV stage

Using Z_t as the instrument, estimate:

$$y_{2,t} = b_{21}y_{1,t} + d_1y_{1,t-1} + d_2y_{2,t-1} + b_{22}\varepsilon_{2,t}$$

↓
get \hat{b}_{21}

Step 2: VAR stage

Estimate the reduced form VAR:

$$Y_t = AY_{t-1} + v_t$$

↓

$$\text{get } \hat{C}(L) = (I - \hat{A}L)^{-1}$$

VAR-IV, Impulse responses

Compute the h period ahead
Impulse Response Function as:

$$IRF_h = \hat{C}_h \begin{bmatrix} 1 \\ \hat{b}_{21} \end{bmatrix}$$

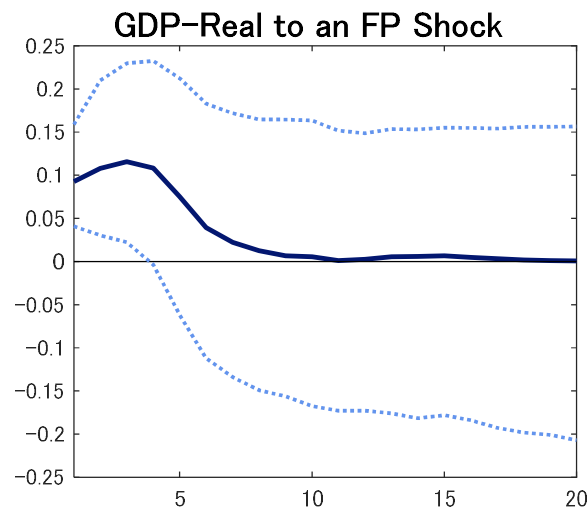
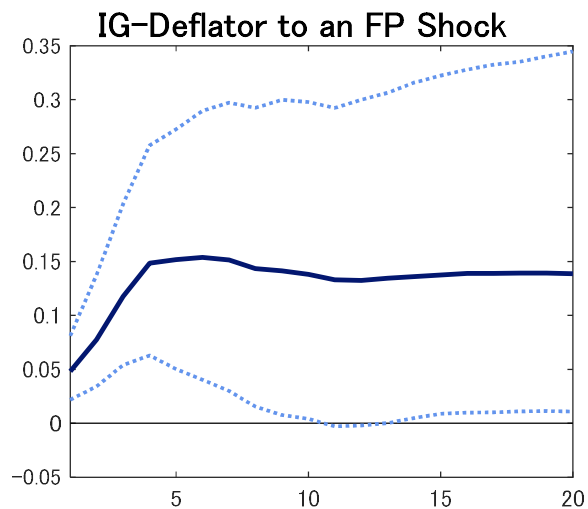
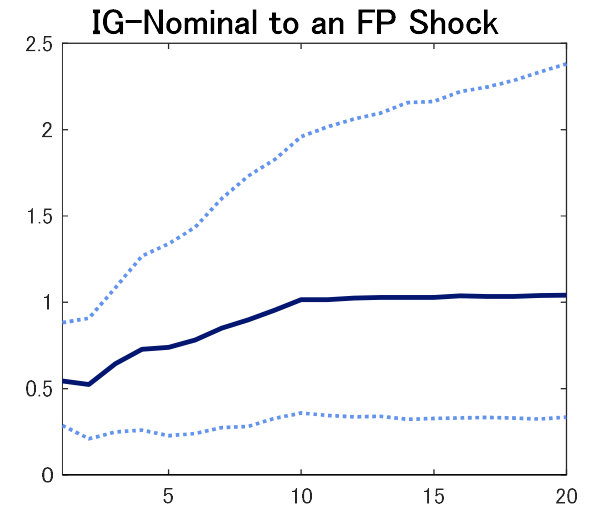
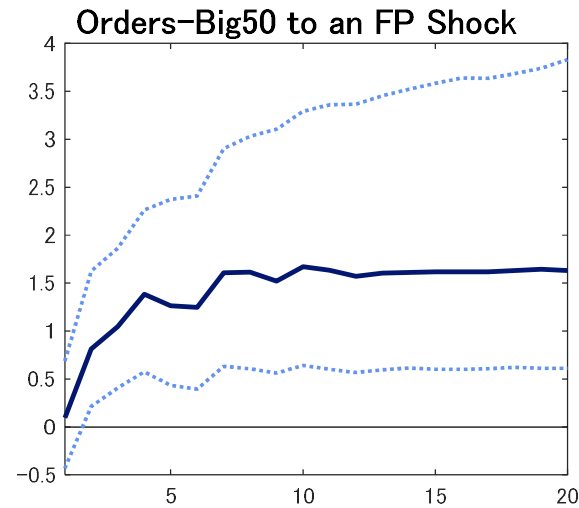
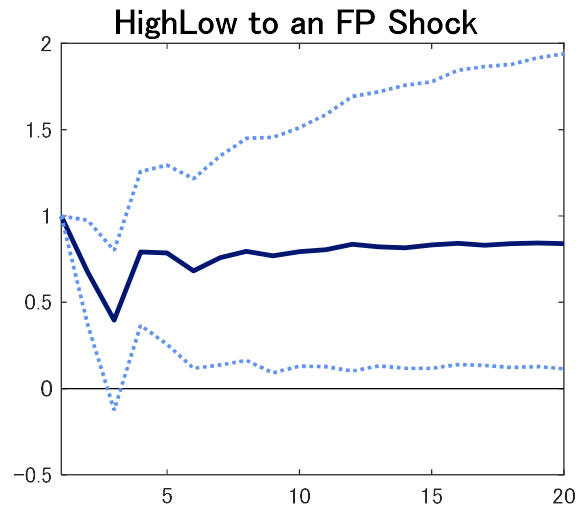
Our case: Use the news indicator as an IV

- Our news variable = Captures only a part of shocks to expectations about future policies.
 - But it is (I think) correlated with true shocks to expectations.
 - And it is (I think) uncorrelated with the other types of shocks.

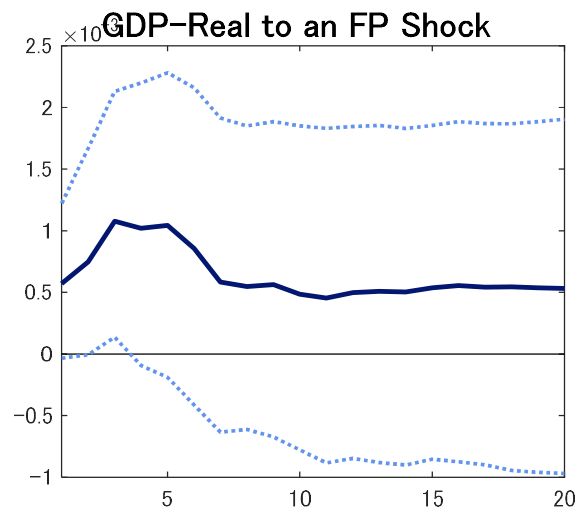
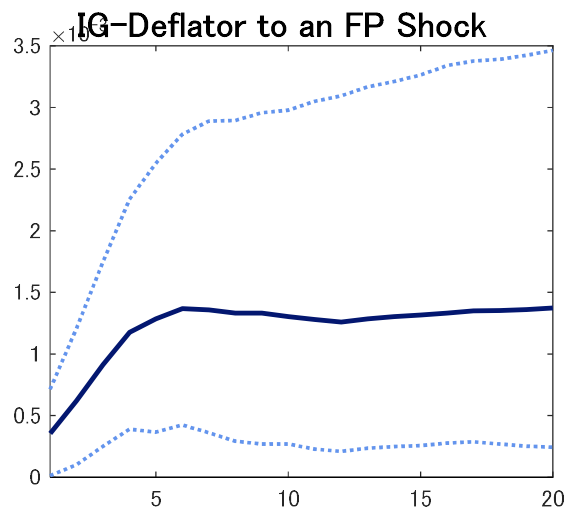
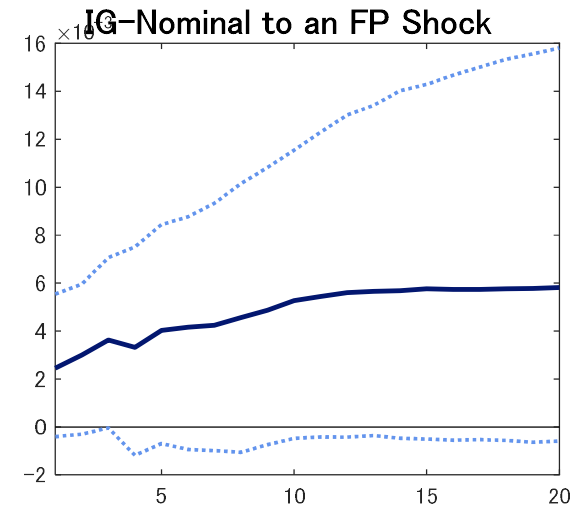
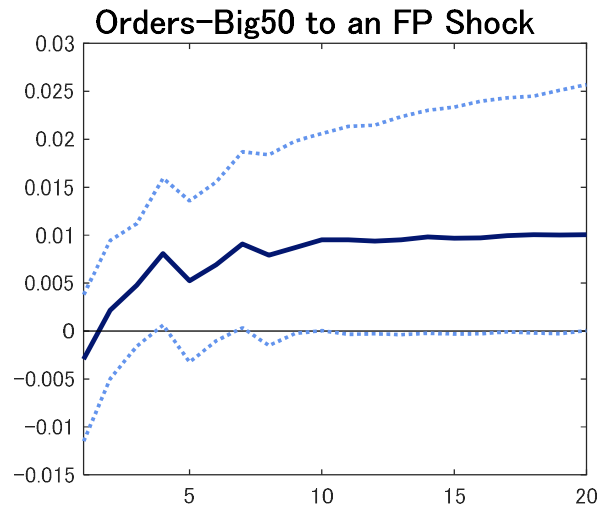
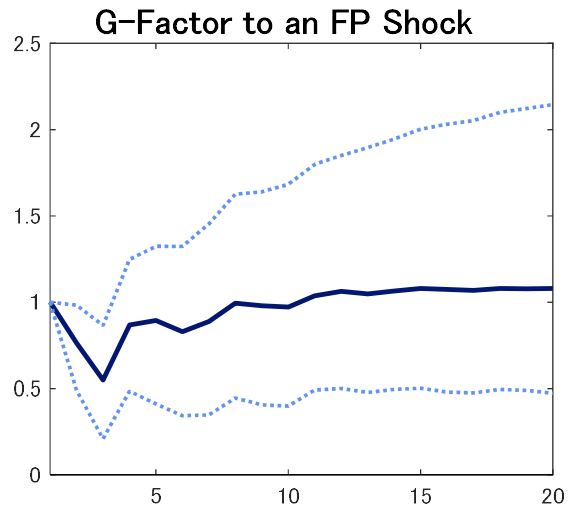
VAR-IV with 5 endogenous variables

- X1 = Stock Mkt Index 1 or 2 (or 0)
- Construction orders from the public sector (top 50 companies)
- Nominal Public Investment (SNA)
- Public Investment Deflator (SNA)
- X5 = One of the macro variables (GDP etc.)
- Details
 - All in log differences except for the news variables.
 - # of lags = 4
 - Dummies for the 3 major earthquakes & Consumption tax hike.

X1 = “Stock Mkt Index **1**”, X5 = Real GDP,
IV = News **1**

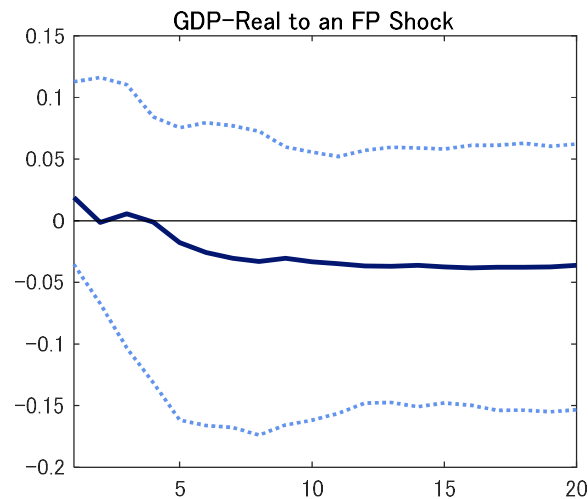
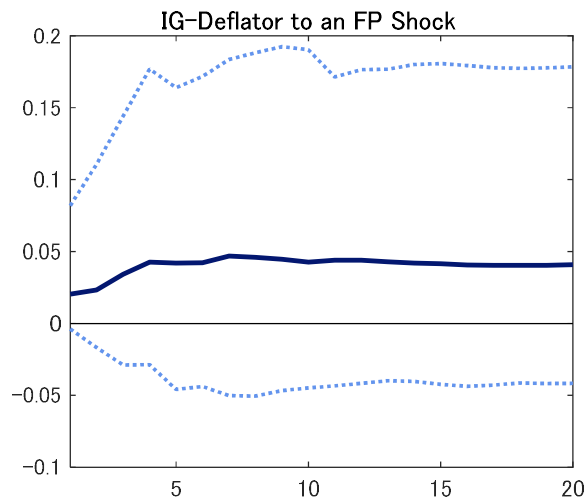
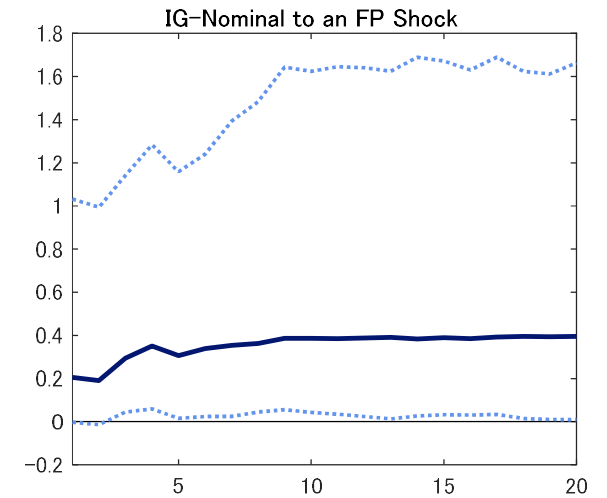
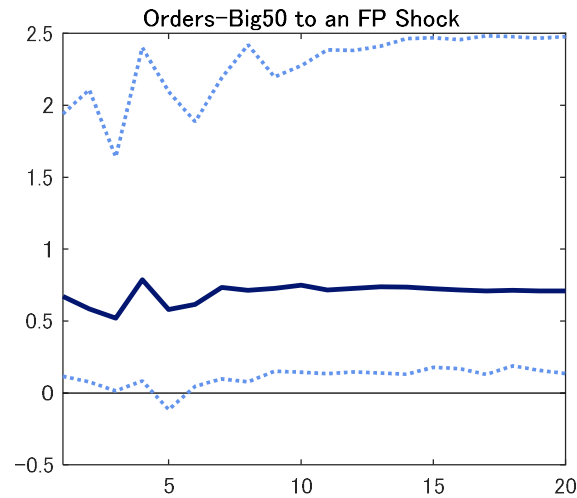
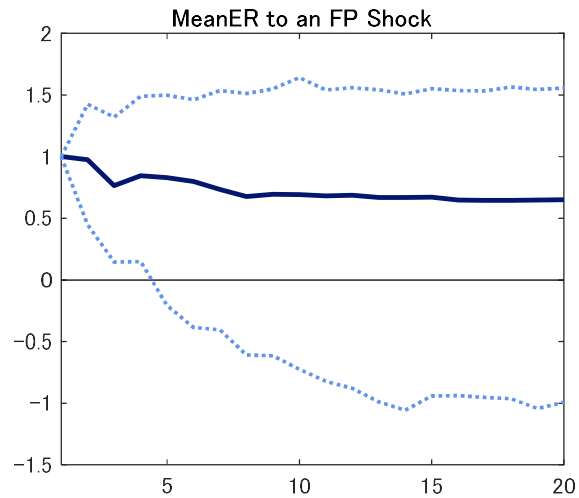


X1 = Stock Mkt Index **2**, X5 = Real GDP,
 IV = News **2**



For comparison:

X1 = Stock Mkt Index **0**, X5 = Real GDP, IV = News **0**



7. Summary

- What we have done:
 - Proposed a new way to estimate effects of an anticipated shock to public investment.
 - Combine stock market info and news.
 - Use VAR-IV
- The identified shock has a positive and significant impact on GDP.
 - Impact elasticity = 0.2-0.3
 - Impact multiplier =2-6! (too large?)

Thank you!
Your comments welcome!

Appendix 1

Extended list of fiscal news dates

**Sorry, this part is in
Japanese!**

1. 緊急経済対策

- Fukuda & Yamada (2011) 日付
 - 1990年-2010年の間に15回の経済対策(ただし公共事業が重要でなかったものを除く)が発動された。それらから63の財政出動(または支出上積み)の日付を特定。
 - 92, 93(×2), 94, 95, 98(×2), 99, 00, 08(×3), 09(×2), 10.
- 我々は2010年以降にリストを拡張
 - 2012年11月 (野田政権、5日付)
 - 2013年1月 (安倍政権(「第2の矢」、7日付)
 - 2013年12月 (安倍政権、5日付)
 - 日付の選定は日経電子版に基づく

2. 震災復興予算

- 補正予算、2011年度中に3回 (1・2次＝菅政権、3次＝野田政権、計11日付)
- 基本方針(2011年7月、全体の予算規模を決定、3日付)
- 予算規模の大幅拡大(2013年1月、安倍政権、4日付).

- 日付の選定は日経電子版による

3. 国政選挙

(公共事業に関する方針が大きく関わったものののみ)

1. 衆議院2009年8月(民主党政権、「ダムから人へ」)
 2. 参議院2010年7月(与党民主党敗北)
 3. 衆議院2012年12月(自民勝利、安倍政権へ)
 4. 参議院2013年7月(自民勝利、ねじれ解消)
- 投票日前と後、それぞれ2日ずつ
 - 追加: 野田首相による解散宣言、2012年11月
(+そのあと2日間)

4. 災害

1. 阪神淡路大震災、1995年1月
2. 中越地震、2004年10月
3. 東日本大震災、2011年3月
 - それぞれ、災害当日+3営業日の各日付についてダミーを生成
 - 阪神淡路と東日本については、損害額推計の公表された日についてもダミーを生成
4. 笹子トンネル崩落事故、2012年12月
 - 事故当日+2営業日の各日付についてダミーを生成

5. スポーツイベントの開催決定

- 長野五輪、1991年6月
- 日韓W杯、1996年6月
- 東京五輪、2013年9月

- それぞれ、ニュースがあってから3営業日の各日付についてダミーを生成

6. 「負の」財政イベント

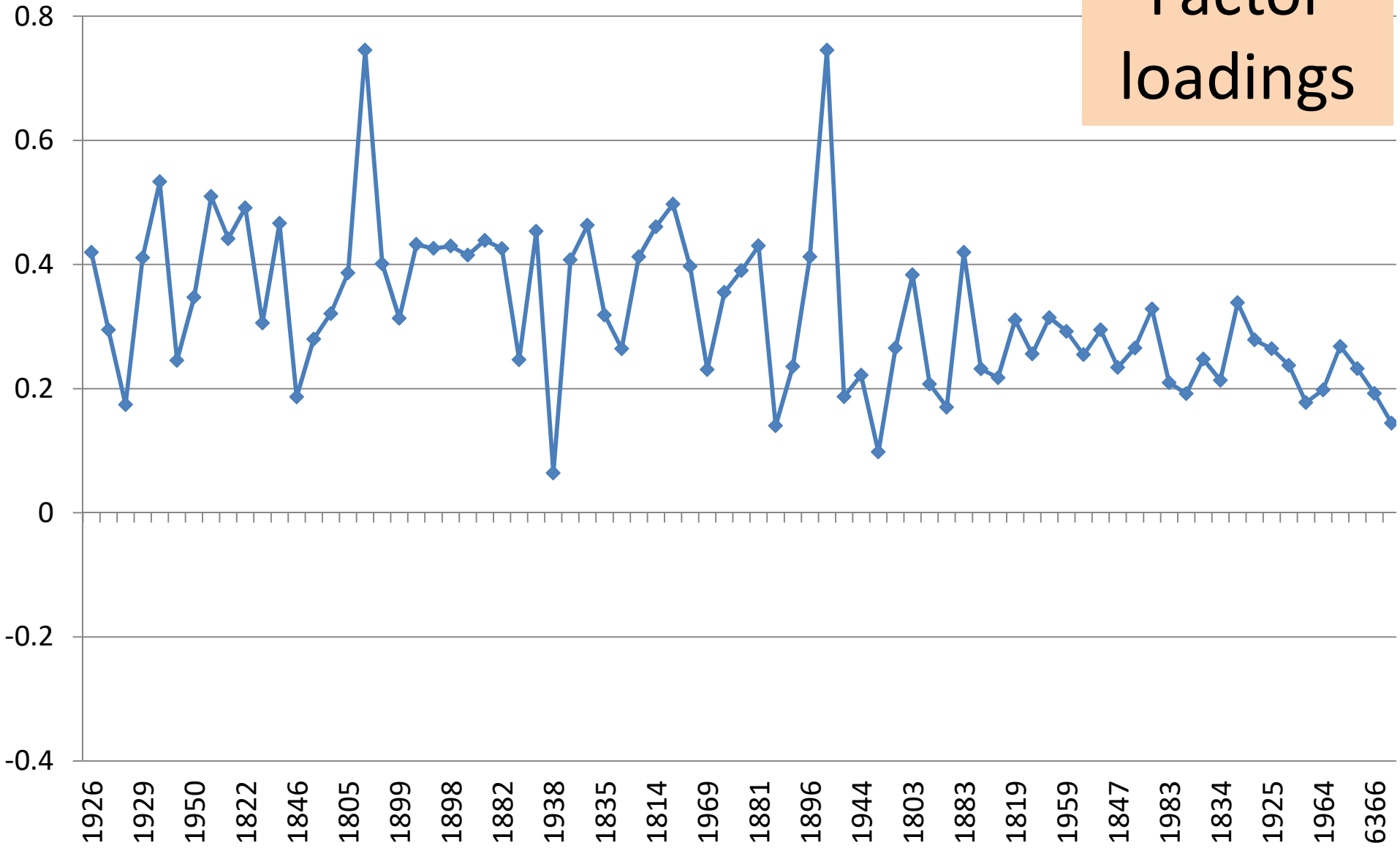
- 橋本改革、1996年 (3日付)
- 小泉改革、2001年 (3日付)
- 民主党「仕分け」、2009年 (18日付)
- 日付の選定は日経テレコンによる

Appendix 2

Factor loadings

Factor1

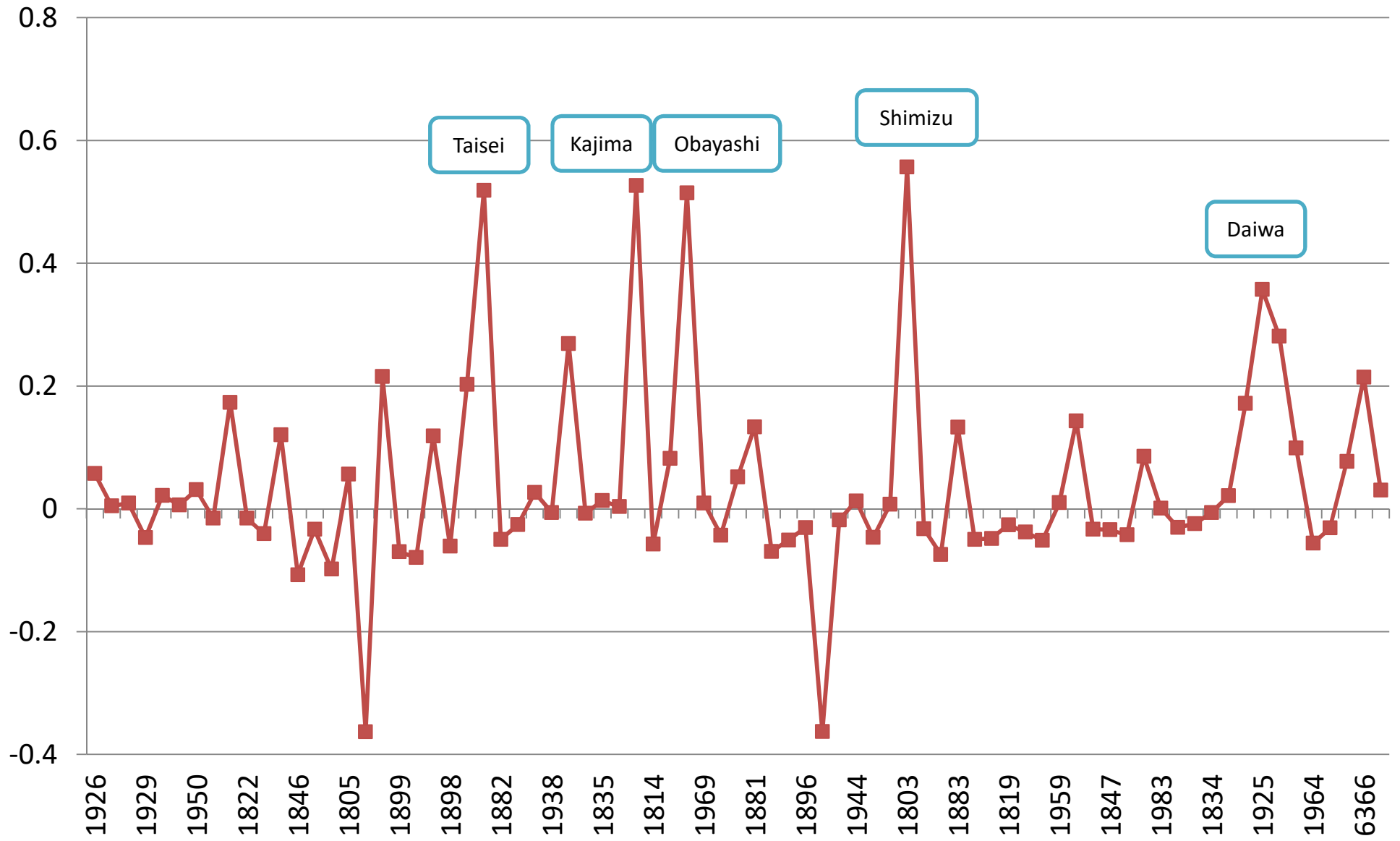
Factor loadings



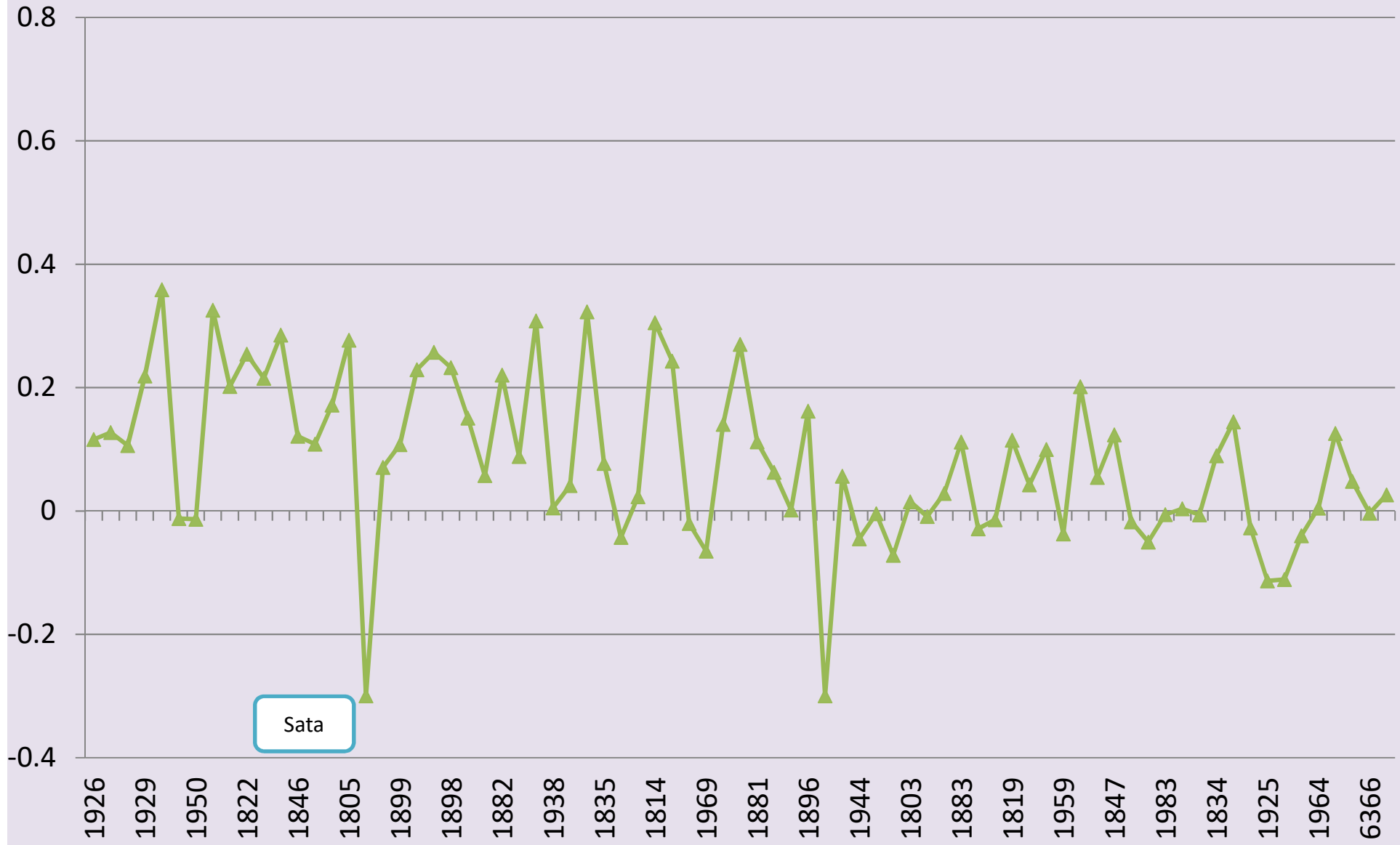
← More gov dependent

Less gov dependent → 57

Factor2

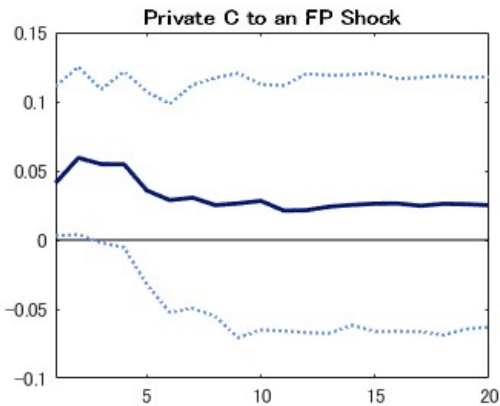
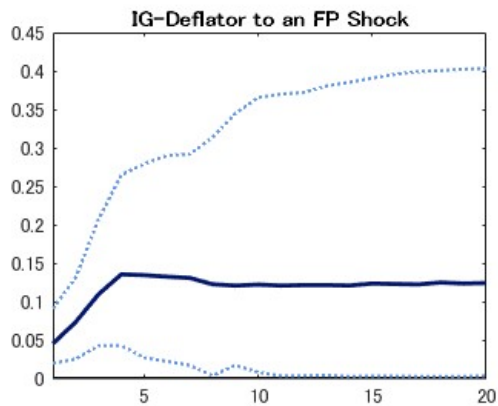
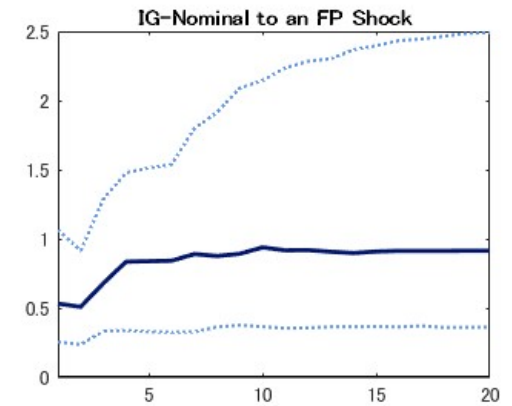
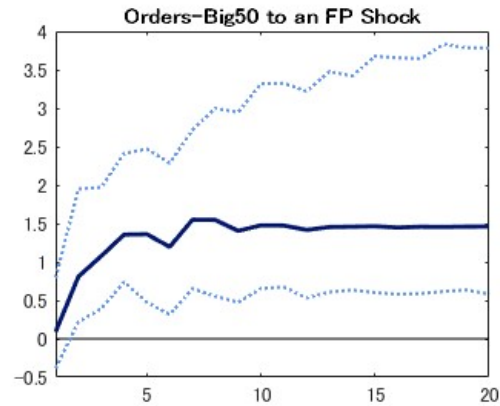
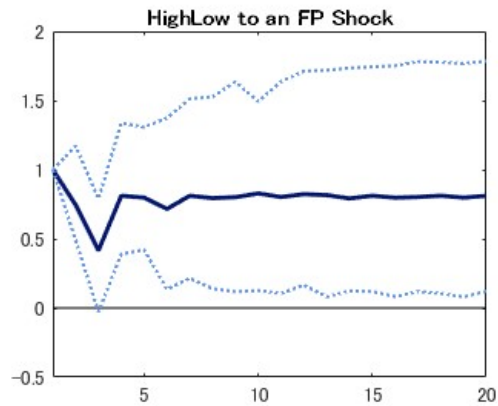


Factor3

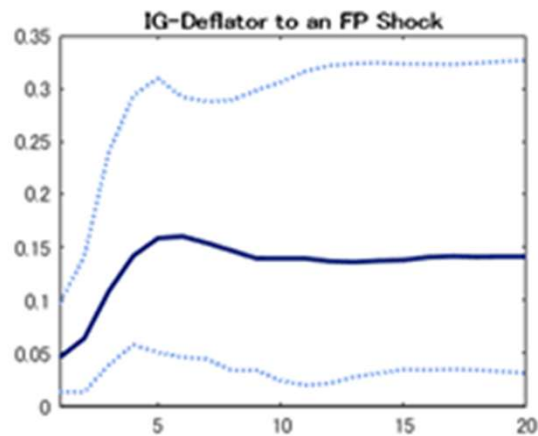
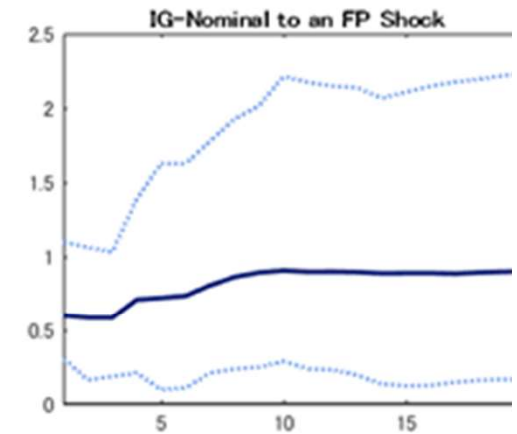
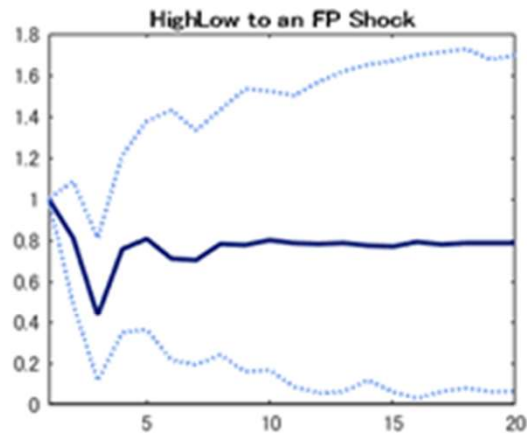


Appendix 3
More IRFs
(X1= High-Low)

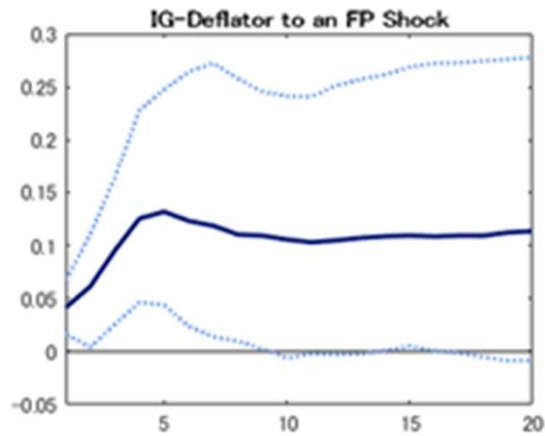
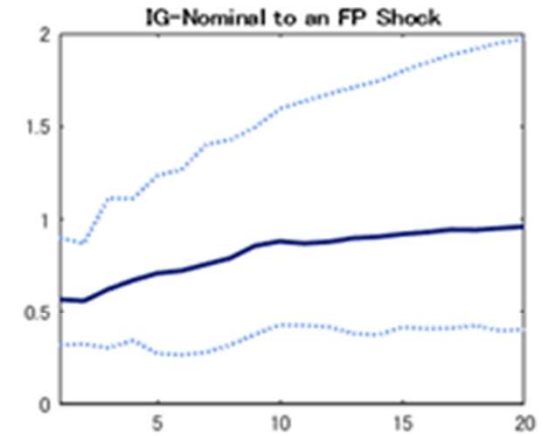
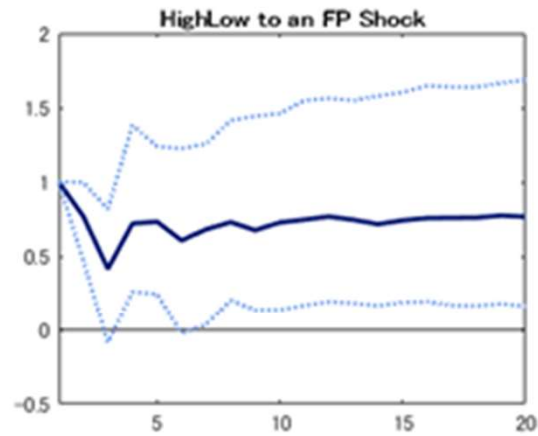
X5 = Real consumption



X5 = Real Business Investment



X5 = GDP Deflator



X5 = Nominal GDP

